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FINAL
BEST DEMONSTRATED AVAILABLE TECHNOLOGY (BDAT) BACKGROUND DOCUMENT FOR

K073

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May 1990

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1. INTRODUCTION AND SUMMARY

Pursuant to section 3004(m) of the Resource Conservation and Recovery Act (RCRA) as enacted by the Hazardous and Solid Waste Amendments on November 8, 1984, the Environmental Protection Agency (EPA) is establishing best demonstrated available technology (BDAT) treatment standards for K073 waste (chlorinated hydrocarbon waste from the purification step of the diaphragm cell process using graphite anodes in chlorine production). Compliance with the BDAT treatment standards is a prerequisite for the placement of the waste in facilities designated as land disposal units according to 40 CFR Part 268. The effective date of the K073 treatment standards is August 8, 1990.

This background document provides the Agency's technical support for selecting and developing the treatment standards for the constituents to be regulated in K073 waste. This document explains how EPA determines BDAT, selects constituents for regulation, and calculates treatment standards. Section 2 presents waste-specific information--the number and location of facilities affected by the land disposal restrictions, the waste-generating process, and waste characterization data. These data serve as a basis for determining whether a variance from treatment standards may be warranted for a particular type of K073 that is more difficult to treat than the wastes that were analyzed in developing the treatment standards for K073. Section 3 discusses the technologies used to treat the waste (or similar wastes), and Section 4 presents available performance data, including data on which the treatment standards are based. Section 5 explains EPA's determination of BDAT, while Section 6 discusses the selection of constituents to be regulated. The treatment standards are determined in Section 7.

The BDAT program, the Agency's legal authority, and promulgated methodology are described in detail in two additional documents: Methodology for Developing BDAT Treatment Standards (USEPA 1989a) and Generic Quality Assurance Project Plan for Land Disposal Restrictions Program ("BDAT") (USEPA 1987). The petition process to be followed in requesting a variance from the BDAT treatment standards is also discussed in the methodology document.

Under 40 CFR 261.32 wastes identified as K073 are listed as follows: chlorinated hydrocarbon waste from the purification step of the diaphragm cell process using graphite anodes in chlorine production. The Agency believes there are no facilities currently generating this waste.

Five constituents (carbon tetrachloride, chloroform, tetrachloroethene, 1,1,1-trichloroethane, and hexachloroethane) are being for regulated in both nonwastewater and wastewater forms of K073 waste. For the purpose of determining the applicability of the treatment standards, wastewaters are defined as wastes containing less than 1 percent (weight basis) total suspended solids* and less than 1 percent (weight basis) total organic carbon (TOC). Waste not meeting this definition must comply with the treatment standards for nonwastewaters.

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*The term "total suspended solids" (TSS) clarifies EPA's previously used terminology of "total solids" and "filterable solids." Specifically, the quantity of total suspended solids is measured by Method 209c, Total Suspended Solids Dried at 103° - 105°C, in Standard Methods for the Examination of Water and Wastewater, 16th Edition (APHA, AWWA, and WPCF 1985).

The Agency does not have performance data for the treatment of K073; therefore, the treatment standards for the regulated volatile and semivolatile organic constituents in nonwastewaters are transferred from treatment performance of incineration of K019 waste.

For K073 wastewaters, BDAT treatment standards for organic constituents are based on treatment performance data transferred from EPA's Final Best Demonstrated Available Technology (BDAT) Background Document for Wastewater Forms of Organic U and P Wastes and Multi-source Leachates (F039) for Which There Are Concentration-Based Treatment Standards, Volume A USEPA 1990.

Table 1-1 lists the specific nonwastewater and wastewater treatment standards for K073 waste. The treatment standards reflect the total constituent concentration; the units are mg/kg (parts per million on a weight-by-weight basis) for the nonwastewaters and mg/l (parts per million on a weight-by-volume basis) for the wastewaters. Note that if the concentrations of the regulated constituents in the waste, as generated, are lower than or equal to the treatment standards, then treatment will not be required prior to land disposal.

Table 1-1 Treatment Standards for K073 Waste

Constituent	Nonwastewaters: Total concentration (mg/kg) (Grab Sample)	Wastewaters: Total concentration (mg/l) (Composite Sample)
Volatile organics		
Carbon tetrachloride	6.2	0.057
Chloroform	6.2	0.046
Tetrachloroethene	6.2	0.056
1,1,1,-Trichloroethane	6.2	0.054
Semivolatile organics		
Hexachloroethane	30	0.055

NA = Not applicable.

2. INDUSTRY AFFECTED AND WASTE CHARACTERIZATION

According to 40 CFR 261.32, K073 waste is listed as follows:

K073: Chlorinated hydrocarbon waste from the purification step of the diaphragm cell process using graphite anodes in chlorine production.

This section describes K073 waste, its generation, and the industry affected by the land disposal restriction of the waste.

2.1 Industry Affected and Process Description

K073 waste was formerly generated by the alkali and chlorine industry (Standard Industrial Classification (SIC) code 2812). The Agency, after consulting the 1986 National Survey of Treatment, Storage, Disposal, and Recycling Facilities (TSDR Survey), knows of no facilities that currently generate K073 waste; K073 was last generated in 1988. However, K073 may at some time be generated by RCRA corrective actions, site closures, or other historical sources.

The Agency has no current information on the process by which the waste is generated. The information presented below was contained in the RCRA Listing Background Document for K073 (USEPA 1980).

In the diaphragm cell process for chlorine production, chlorine is produced by electrolysis of brine. Brine is purified by precipitation of metals before being sent to the diaphragm cell. Separation of solids during purification generates waste brine muds. The purified brine is heated, brought to saturation by the addition of salt, and acidified. The saturated salt solution is then electrolyzed in the diaphragm cell to form chlorine, hydrogen, and sodium hydroxide. Chlorine is liberated at the anode; the hydrogen and sodium hydroxide are produced at the

cathode. Reaction of chlorine with carbonaceous materials in the graphite anode results in the presence of chlorinated hydrocarbon contaminants in the chlorine product.

The hydrogen is purified and sold, vented to the atmosphere, or burned. The salt solution, which has been decomposed to approximately half its original concentration, is partially evaporated to increase the sodium hydroxide concentration. During evaporation, most of the sodium chloride precipitates from the solution and is recovered in salt separators. After filtration and washing, the salt is recycled to initial brine preparation.

Chlorine is recovered from the cell and cooled to remove water and other impurities. The condensates are discharged or recycled to the brine purifier. After cooling, the chlorine gas is scrubbed with acid to remove residual water vapor. The gas is then compressed and cooled to -30°C to -45°C. At these temperatures, the chlorine liquefies and is pumped to steel storage tanks. Some further purification of chlorine is performed during the cooling and liquefaction process. During the compression and purification step, the K073 is ultimately generated. Figure 2-1 illustrates the process.

2.2 Waste Characterization

EPA was not able to collect characterization data for K073 because generation of this waste has been discontinued. Limited compositional data was provided by The Chlorine Institute, Inc., and the Listing Background Document for K073. Table 2-1 provides an approximation of the composition of K073 waste.

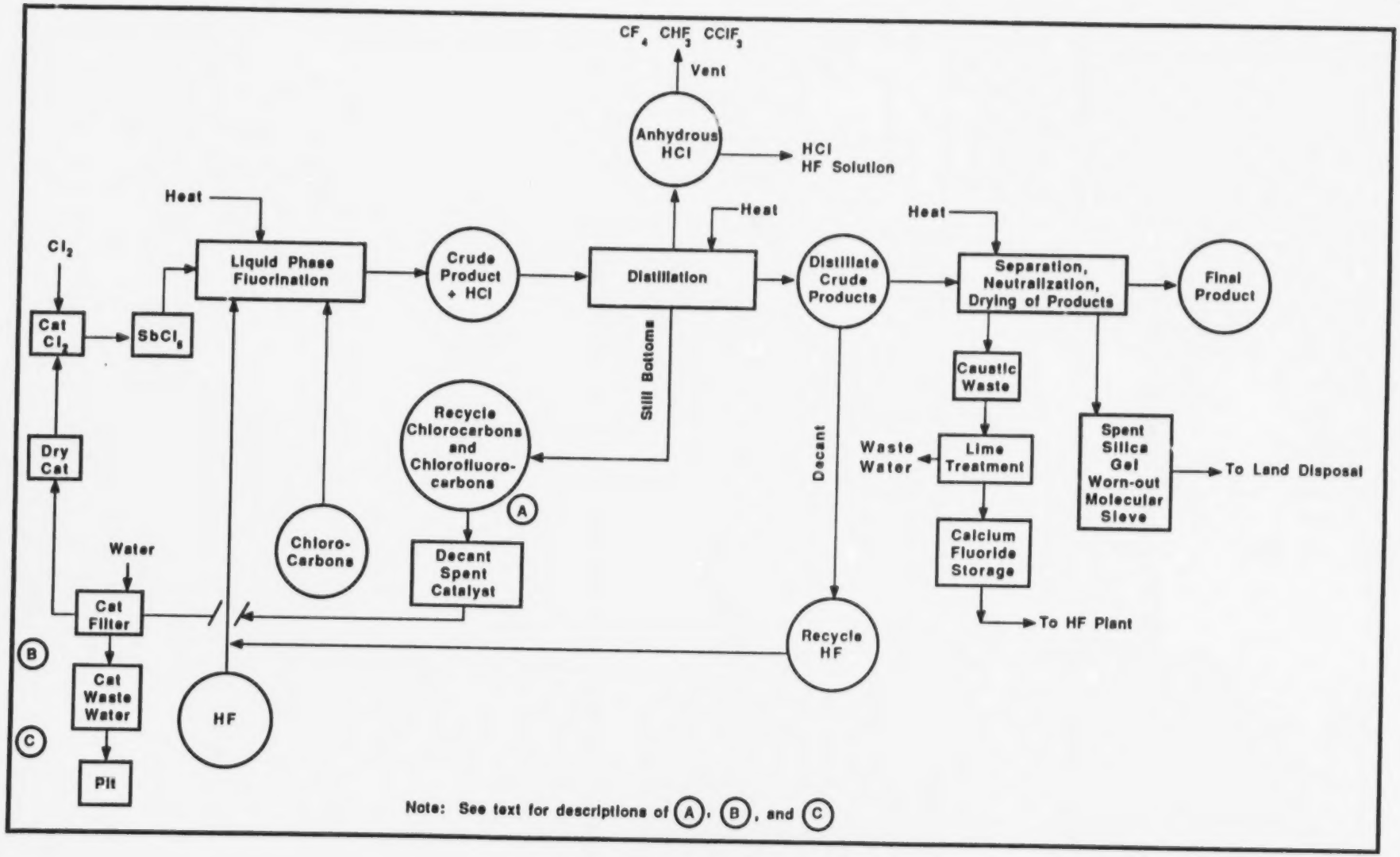

Figure 2-1. Flowsheet for Production of Fluorocarbons by Liquid Phase Fluorination

Table 2-1 Composition Data for K073

Constituent	Chlorine Institute wt (%)	Listing background document wt (%)
Chloroform	50-80	73.7
Carbon Tetrachloride	4-24	10.8
Hexachloroethane		8.0
Pentachloroethane	0-2	1.3
1,1,1-Trichloroethane		1.0
Tetrachloroethylene	0-1	0.6
Dichloroethylene		0.3
1,1,2,2-Tetrachloroethane		0.5
Chlorinated Propane Derivatives		3.7
Trichloroethylene	0-6	
Dissolved Chlorine	0-7	
Others (Unknown)	1-13	

3. APPLICABLE AND DEMONSTRATED TREATMENT TECHNOLOGIES

This section identifies the treatment technologies that are applicable to K073 waste and determines which, if any, of the applicable technologies can be considered demonstrated for the purposes of establishing BDAT.

To be applicable, a technology must be theoretically usable to treat the waste in question or to treat a waste that is similar in terms of the parameters that affect treatment selection. (For detailed descriptions of the technologies applicable for these wastes, or for wastes judged to be similar, see EPA's Treatment Technology Background Document (USEPA 1989b).) To be demonstrated, the technology must be employed in full-scale operation for the treatment of the waste in question or a similar waste. Technologies available only at research facilities or in pilot- and bench-scale operations are not considered in identifying demonstrated technologies.

3.1 Applicable Treatment Technologies

As shown in Section 2.2, K073 waste contains primarily organic constituents. Applicable technologies for organic constituents in a waste or any resulting treatment residuals include technologies that destroy or reduce the amount of constituent present in the waste.

The Agency has identified fuel substitution and incineration as applicable technologies for treating the organic constituents in untreated K073 nonwastewaters. These treatment technologies were identified based on current literature sources, field testing, and current waste treatment practices. As treatment processes, fuel substitution and incineration have the same purpose: to thermally destroy the organic constituents in the waste by converting them to carbon dioxide and water. Fuel substitution additionally uses the waste

as a substitute for conventional fuels burned in high-temperature industrial processes. Both fuel substitution and incineration generally result in nonwastewater and wastewater treatment residuals such as ash, clarifier solids from the flue gas scrubber system, and scrubber water, which may require further treatment. The residuals from the treatment of K073 nonwastewaters in a well-designed, well-operated fuel substitution combustion device or incinerator are not expected to contain detectable levels of organic constituents (that is, amounts of organic constituents should be below a numerical limit) and thus should not require further treatment for organics.

Since wastewater forms of K073 wastes contain hazardous organic constituents at treatable concentrations, applicable technologies include those that destroy or reduce the total amount of various organic compounds in the wastewater. Therefore, the Agency has identified the following treatment technologies as potentially applicable for treatment of these wastes:

- Biological Treatment (including aerobic fixed film, aerobic lagoons, activated sludge, anaerobic fixed film, rotating biological contractor, sequential batch reactor, and trickling filter technologies);
- PACT^{R} Treatment (including powdered activated carbon addition to activated sludge and biological granular activated carbon technologies);
- Carbon Adsorption Treatment (including activated carbon and granular activated carbon technologies);
- Solvent Extraction Treatment (including liquid-liquid extracting technology);
- Chemical Oxidation Treatment;
- Wet Air Oxidation Treatment (including supercritical oxidation technology);

- Stripping Treatment (including steam stripping and air stripping technologies);
- Reverse Osmosis Treatment; and
- Chemically Assisted Clarification Treatment (including chemical precipitation technology).

These technologies are explained in more detail in the background document for U&P wastewaters (USEPA 1990).

3.2 Demonstrated Treatment Technologies

There are currently no known generators of K073 waste; therefore, the Agency has no data indicating that incineration or fuel substitution is being used on K073 waste. The Agency does have data, however, on incineration of a similar waste (K019) and believes, therefore, that incineration would be a demonstrated technology for K073 nonwastewaters. The Agency has no evidence that fuel substitution is being used on wastes having similar chlorinated organic concentrations. When chlorinated hydrocarbons are combusted, hydrogen chloride gas or chlorine gas is produced. These gases may not be compatible with normal fuel uses in industrial furnaces or boilers (i.e., they may not be compatible with the furnace materials of construction or the furnace product quality). Thus EPA does not believe that fuel substitution would be a demonstrated technology for K073 nonwastewaters. Incineration, therefore, is the only demonstrated technology for K073 nonwastewaters.

To be demonstrated, a technology must be employed in full-scale operation for treatment of the waste in question or a similar waste. Technologies available only at pilot- or bench-scale operations are not considered in identifying demonstrated technologies.

All of the technologies identified as applicable for K073 wastewaters have been demonstrated in full-scale operation for treatment of wastewaters containing these various constituents or similar constituents. The Agency, therefore, believes that all of the technologies presented in Section 3.1 should be considered demonstrated for use in determining BDAT.

4. PERFORMANCE DATA BASE

Where data are not available on the treatment of the specific wastes of concern, the Agency may elect to transfer data on the treatment of a similar waste or wastes, using a demonstrated technology. To transfer data from another waste category, EPA must find that the wastes covered by this background document are no more difficult to treat (based on the waste characteristics that affect performance of the demonstrated treatment technology) than the treated wastes from which performance data are being transferred.

This section presents the data available to EPA on the performance of demonstrated technologies in treating the listed wastes. These data are used elsewhere in this document for determining which technologies represent BDAT (Section 5), for selecting constituents to be regulated (Section 6), and for developing treatment standards (Section 7). Eligible data, in addition to full-scale demonstration data, may include data developed at research facilities or obtained through other applications at less than full-scale operation, as long as the technology is demonstrated in full-scale operation for a similar waste or wastes as defined in Section 3.

Performance data, to the extent that they are available to EPA, include the untreated and treated waste concentrations for a given constituent, values of operating parameters that were measured at the time the waste was being treated, values of relevant design parameters for the treatment technology, and data on waste characteristics that affect performance of the treatment technology.

No performance data are available to the Agency to characterize treatment for K073. (K073 can be characterized as a totally organic waste and no metals treatment standards are justified.) However, the

Agency has data for incineration of a similar waste, K019, which, as defined by 40 CFR 261.32, is the heavy ends from the distillation of ethylene dichloride in ethylene dichloride production. K019 contains all the constituents expected to be present in K073 (i.e., carbon tetrachloride, chloroform, hexachloroethane, tetrachloroethene, and 1,1,1-trichloroethane). This similarity between K019 and K073 is based on the production processes, the waste compositions, and the waste characteristics affecting performance of the demonstrated treatment technology. Evaluation of the waste composition for K073 reveals that this waste is composed primarily of chloroform and carbon tetrachloride, for which the respective boiling points are 61°C and 76.8°C. These boiling points are lower than the boiling points of most constituents in K019. A waste is considered easier to treat if the boiling points of its constituents are lower than the boiling points of constituents in a waste considered for transfer. This is outlined in detail in the methodology document (USEPA 1989a). Therefore, K019 is considered more difficult to treat than K073. The K019 constituents that are present in K073 have been treated to nondetectable levels (levels below the numerical limit of detection). The waste characteristics affecting the performance of incineration are presented in the Treatment Technology Background Document (USEPA 1989b). The Agency is transferring performance data from the treatment of K019 to the K073 nonwastewaters since the Agency believes that K073 is no more difficult to treat than the tested K019 waste.

The performance data for K019 waste include the untreated and treated waste concentrations for a given constituent, the values of operating parameters that were measured at the time the waste was being treated, the values of relevant design parameters for the treatment technology, and data on waste characteristics that affect the performance of the treatment technology.

Treatment standards for organic BDAT List Constituents in K073 wastewaters were developed from treatment performance data transferred from EPA's Final Best Demonstrated Available Technology (BDAT) Background Document for Wastewater Forms of Organic U and P Wastes and Multi-source Leachates (F039) for Which There Are Concentration-Based Treatment Standards, Volume A USEPA 1990.

Treatment performance data from Volume A (USEPA 1990) are presented in Appendix A. These data were used for transfer to K073 wastewaters because when the Agency has appropriate wastewater treatment data from well-designed and well-operated wastewater treatment units, it prefers to use these data rather than scrubber water concentrations in setting BDAT treatment standards. Additionally, these data represent a specific wastewater treatment technology as opposed to incineration scrubber water.

Tables 4-1 through 4-6 present the data for total waste concentration analyses for treated and untreated K019 waste, as well as the design and operating data for the incineration treatment system. Based on a review of the operating data obtained during collection of the samples, the data sets appear to reflect treatment by a well-operated system. Furthermore, in all cases the BDAT list organics detected in the untreated waste are reduced to nondetectable levels in the treated residuals.

The tables in Appendix A present the data from Volume A of the Background Document for Third Third U and P Wastes and Multi-Source Leachates (USEPA 1990). These data were used to develop treatment standards for K073 wastewaters.

Table 4-1 TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - ROTARY KILN INCINERATOR

SAMPLE SET #1

Detected BDAT List Organic Constituents	Untreated Waste K019 Concentration mg/kg (ppm)	Untreated Waste RCRA Blend* Concentration mg/kg (ppm)	Treated Waste Kiln Ash Concentration mg/kg (ppm)
VOLATILES			
4. Benzene	<2,000	2,000	<2
7. Carbon tetrachloride	4,000	<8	<2
9. Chlorobenzene	3,000	<8	<2
14. Chloroform	4,600	<8	<2
22. 1,1-Dichloroethane	2,200	<8	<2
23. 1,2-Dichloroethane	93,000	<8	<2
34. Methyl ethyl ketone	<1,000	940	<10
38. Methylene chloride	<1,000	910	<10
42. Tetrachloroethene	7,300	490	<2
43. Toluene	<200	2,300	<2
45. 1,1,1-Trichloroethane	81,000	130	<2
47. Trichloroethene	3,210	360	<2
215-217. Xylene (total)	<200	3,400	<2
222. Acetone	<1,000	1,200	<10
226. Ethyl benzene	<200	2,200	<2
229. Methyl isobutyl ketone	<1,000	1,100	<10
SEMIVOLATILES			
51. Acenaphthalene	<10	150	<2
57. Anthracene	<10	110	<2
65. Benzo(k)fluoranthene	<10	67	<2
68. Bis(2-chloroethyl) ether	280	<20	<2
70. Bis(2-ethylhexyl) phthalate	<10	40	<2
80. Chrysene	SNA	28	<2
87. o-Dichlorobenzene	<10	250	<2
88. p-Dichlorobenzene	81	32	<2
98. Di-n-butyl phthalate	<10	31	<2
108. Fluoranthene	<10	120	<2
109. Fluorene	20	53	<2
110. Hexachlorobenzene	69	<100	<10

SNA A standard is not available; the compound was searched using an NBS Library database of 42,000 compounds. The compound was not detected.

* Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-1 (Continued)

SAMPLE SET #1 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste: K019 Concentration mg/kg (ppm)	Untreated Waste: RCRA Blend* Concentration mg/kg (ppm)	Treated Waste: Kiln Ash Concentration mg/kg (ppm)	Treated Waste: Kiln Ash TCLP mg/L (ppm)
SEMIVOLATILES (Continued)				
111. Hexachlorobutadiene	<50	210	<10	
113. Hexachloroethane	120	<100	<10	
121. Naphthalene	470	<20	<2	
126. Nitrobenzene	<25	3,400	<5	
136. Pentachlorobenzene	61	<100	<10	
141. Phenanthrene	21	240	<2	
142. Phenol	<10	78	<2	
145. Pyrene	<10	200	<2	
148. 1,2,4,5-Tetrachlorobenzene	76	<50	<5	
150. 1,2,4-Trichlorobenzene	100	<50	<5	
Detected BDAT List Metal and Inorganic Constituents				
METALS				
154. Antimony	<6.0	24	8.0	<0.060
155. Arsenic	1.2	94	3.6	<0.002
156. Barium	0.97	1.3	26	0.033
158. Cadmium	0.63	<0.3	0.66	<0.003
159. Chromium	4.0	40	44	0.200
160. Copper	2.1	165	2,370	2.690
161. Lead	3.4	27	120	0.380
163. Nickel	3.0	8.8	66	0.680
165. Silver	<0.9	<0.9	3.3	<0.009
167. Vanadium	<2.0	2.2	4.1	<0.020
168. Zinc	5.8	4,170	12	0.052
INORGANICS				
169. Total Cyanide	<0.5	0.9	<0.47	
170. Fluoride	<5.0	31	38	
171. Sulfide	790	830	68	

*Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-1 (Continued)

SAMPLE SET #1 (Continued)

DESIGN AND OPERATING PARAMETERS

Parameter	Design	Operating Value
Kiln Temperature (^{o}F)+	*	1825-1900
Kiln Solids Residence Time (min)	*	120
Waste Feed Rate (MMBTU/hr)+	*	K019: 13.1 RCRA Blend, Waste Burner #1: 3.9-5.5 RCRA Blend, Waste Burner #2: 4.4-9.7
Kiln Rotational Speed (RPM)	*	0.19-0.21

*This information has been claimed as RCRA Confidential Business Information.

Table 4-2 TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - ROTARY KILN INCINERATOR

SAMPLE SET #2

Detected BDAT List Organic Constituents	Untreated Waste K019 Concentration mg/kg (ppm)	Untreated Waste RCRA Blend* Concentration mg/kg (ppm)	Treated Waste Kiln Ash Concentration mg/kg (ppm)
VOLATILES			
4. Benzene	<2,000	2,000	<2
7. Carbon tetrachloride	3,800	<8	<2
9. Chlorobenzene	<2,000	<8	<2
14. Chloroform	5,800	<8	<2
22. 1,1-Dichloroethane	<2,000	<8	<2
23. 1,2-Dichloroethane	96,000	<8	<2
34. Methyl ethyl ketone	<10,000	940	<10
38. Methylene chloride	<10,000	910	<10
42. Tetrachloroethene	6,700	490	<2
43. Toluene	<2,000	2,300	<2
45. 1,1,1-Trichloroethane	33,000	130	<2
47. Trichloroethene	2,400	360	<2
215-217. Xylene (total)	<2,000	3,400	<2
222. Acetone	<10,000	1,200	<10
226. Ethyl benzene	<2,000	2,200	<2
229. Methyl isobutyl ketone	<10,000	1,100	<10
SEMIVOLATILES			
51. Acenaphthalene	<10	150	<2
57. Anthracene	<10	110	<2
65. Benzo(k)fluoranthene	<10	67	<2
68. Bis(2-chloroethyl) ether	280	<20	<2
70. Bis(2-ethylhexyl) phthalate	<10	40	<2
80. Chrysene	SNA	28	<2
87. o-Dichlorobenzene	<10	250	<2
88. p-Dichlorobenzene	74	32	<2
98. Di-n-butyl phthalate	<10	31	<2
108. Fluoranthene	<10	120	<2
109. Fluorene	16	53	<2
110. Hexachlorobenzene	60	<100	<10

SNA A standard is not available; the compound was searched using an NBS Library database of 42,000 compounds. The compound was not detected.

* Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-2 (Continued)

SAMPLE SET #2 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste K019 Concentration mg/kg (ppm)	Untreated Waste RCRA Blend* Concentration mg/kg (ppm)	Treated Waste Kiln Ash Concentration mg/kg (ppm)	Treated Waste Kiln Ash TCLP mg/L (ppm)
SEMIVOLATILES (Continued)				
111. Hexachlorobutadiene	<50	210	<10	
113. Hexachloroethane	85	<100	<10	
121. Naphthalene	314	<20	<2	
126. Nitrobenzene	<25	3,400	<5	
136. Pentachlorobenzene	51	<100	<10	
141. Phenanthrene	15	240	<2	
142. Phenol	<10	78	<2	
145. Pyrene	<10	200	<2	
148. 1,2,4,5-Tetrachlorobenzene	62	<50	<5	
150. 1,2,4-Trichlorobenzene	65	<50	<5	
Detected BDAT List Metal and Inorganic Constituents				
METALS				
154. Antimony	<6.0	24	6.8	<0.060
155. Arsenic	<0.2	94	2.8	<0.002
156. Barium	<0.9	1.3	23	0.036
158. Cadmium	0.46	<0.3	0.96	0.004
159. Chromium	3.4	40	60	0.130
160. Copper	1.7	165	3,430	2.380
161. Lead	2.3	27	42	0.260
163. Nickel	3.6	8.8	89	0.560
165. Silver	<0.9	<0.9	3.4	<0.009
167. Vanadium	<2.0	2.2	4.8	<0.020
168. Zinc	6.9	4,170	13	0.071
INORGANICS				
169. Total Cyanide	<0.5	0.9	<0.47	
170. Fluoride	<5.0	31	5.1	
171. Sulfide	NA	830	<50	

NA Not Analyzed.

*Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-2 (Continued)

SAMPLE SET #2 (Continued)

DESIGN AND OPERATING PARAMETERS

Parameter	Design	Operating Value
Kiln Temperature (°F)+	*	1800-1880
Kiln Solids Residence Time (min)	*	120
Waste Feed Rate (MMBTU/hr)+	*	K019: 12.2 RCRA Blend, Waste Burner #1: 5.2-5.5 RCRA Blend, Waste Burner #2: 4.4-9.7
Kiln Rotational Speed (RPM)	*	0.19-0.21

*This information has been claimed as RCRA Confidential Business Information.

Table 4-3 TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - ROTARY KILN INCINERATOR

SAMPLE SET #3

Detected BDAT List Organic Constituents	Untreated Waste K019 Concentration mg/kg (ppm)	Untreated Waste RCRA Blend* Concentration mg/kg (ppm)	Treated Waste Kiln Ash Concentration mg/kg (ppm)
VOLATILES			
4. Benzene	<2,000	2,000	<2
7. Carbon tetrachloride	3,500	<8	<2
9. Chlorobenzene	<2,000	<8	<2
14. Chloroform	5,000	<8	<2
22. 1,1-Dichloroethane	<2,000	<8	<2
23. 1,2-Dichloroethane	87,000	<8	<2
34. Methyl ethyl ketone	<10,000	940	<10
38. Methylene chloride	<10,000	910	<10
42. Tetrachloroethene	6,000	490	<2
43. Toluene	<2,000	2,300	<2
45. 1,1,1-Trichloroethane	34,000	130	<2
47. Trichloroethene	2,200	360	<2
215-217. Xylene (total)	<2,000	3,400	<2
222. Acetone	<10,000	1,200	<10
226. Ethyl benzene	<2,000	2,200	<2
229. Methyl isobutyl ketone	<10,000	1,100	<10
SEMIVOLATILES			
51. Acenaphthalene	<10	150	<2
57. Anthracene	<10	110	<2
65. Benzo(k)fluoranthene	<10	67	<2
68. Bis(2-chloroethyl) ether	290	<20	<2
70. Bis(2-ethylhexyl) phthalate	<10	40	<2
80. Chrysene	SNA	28	<2
87. o-Dichlorobenzene	<10	250	<2
88. p-Dichlorobenzene	80	32	<2
98. Di-n-butyl phthalate	<10	31	<2
108. Fluoranthene	<10	120	<2
109. Fluorene	19	53	<2
110. Hexachlorobenzene	73	<100	<10

SNA A standard is not available; the compound was searched using an NBS Library database of 42,000 compounds. The compound was not detected.

* Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-3 (Continued)

SAMPLE SET #3 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste: K019 Concentration mg/kg (ppm)	Untreated Waste: RCRA Blend* Concentration mg/kg (ppm)	Treated Waste: Kiln Ash Concentration mg/kg (ppm)	Treated Waste: Kiln Ash TCLP mg/L (ppm)
SEMIVOLATILES (Continued)				
111. Hexachlorobutadiene	<50	210	<10	
113. Hexachloroethane	95	<100	<10	
121. Naphthalene	350	<20	<2	
126. Nitrobenzene	<25	3,400	<5	
136. Pentachlorobenzene	59	<100	<10	
141. Phenanthrene	11	240	<2	
142. Phenol	<10	78	<2	
145. Pyrene	<10	200	<2	
148. 1,2,4,5-Tetrachlorobenzene	67	<50	5	
150. 1,2,4-Trichlorobenzene	70	<50	<5	
Detected BDAT List Metal and Inorganic Constituents				
METALS				
154. Antimony	<6.0	24	9.2	<0.060
155. Arsenic	<0.2	94	5.7	<0.002
156. Barium	<0.9	1.3	54	0.057
158. Cadmium	0.53	<0.3	3.6	0.005
159. Chromium	3.5	40	202	0.260
160. Copper	1.7	165	2,290	7.030
161. Lead	3.4	27	118	0.620
163. Nickel	2.3	8.8	169	0.960
165. Silver	<0.9	<0.9	1.9	<0.009
167. Vanadium	<2.0	2.2	6.0	<0.020
168. Zinc	4.4	4,170	16	0.170
INORGANICS				
169. Total Cyanide	<0.5	0.9	<0.47	
170. Fluoride	<5.0	31	6.1	
171. Sulfide	NA	830	64	

NA = Not Analyzed.

* Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-3 (Continued)

SAMPLE SET #3 (Continued)

DESIGN AND OPERATING PARAMETERS

Parameter	Design	Operating Value
Kiln Temperature (°F)-	*	1850-1900
Kiln Solids Residence Time (min)	*	120
Waste Feed Rate (MMBTU/hr)-	*	K019: 12.4 RCRA Blend, Waste Burner #1: 5.2-5.8 RCRA Blend, Waste Burner #2: 4.4-8.4
Kiln Rotational Speed (RPM)	*	0.19-0.21

*This information has been claimed as RCRA Confidential Business Information.

Table 4-4 TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - ROTARY KILN INCINERATOR

SAMPLE SET #4

Detected BDAT List Organic Constituents	Untreated Waste K019 Concentration mg/kg (ppm)	Untreated Waste RCRA Blend* Concentration mg/kg (ppm)	Treated Waste Kiln Ash Concentration mg/kg (ppm)
VOLATILES			
4. Benzene	<2,000	2,000	<2
7. Carbon tetrachloride	3,900	<8	<2
9. Chlorobenzene	<2,000	<8	<2
14. Chloroform	5,300	<8	<2
22. 1,1-Dichloroethane	<2,000	<8	<2
23. 1,2-Dichloroethane	122,000	<8	<2
34. Methyl ethyl ketone	<10,000	940	<10
38. Methylene chloride	<10,000	910	<10
42. Tetrachloroethene	7,200	490	<2
43. Toluene	<2,000	2,300	<2
45. 1,1,1-Trichloroethane	44,000	130	<2
47. Trichloroethene	2,300	360	<2
215-217. Xylene (total)	<2,000	3,400	<2
222. Acetone	<10,000	1,200	<10
226. Ethyl benzene	<2,000	2,200	<2
229. Methyl isobutyl ketone	<10,000	1,100	<10
SEMIVOLATILES			
51. Acenaphthalene	<10	150	<2
57. Anthracene	<10	110	<2
65. Benzo(k)fluoranthene	<10	67	<2
68. Bis(2-chloroethyl) ether	310	<20	<2
70. Bis(2-ethylhexyl) phthalate	<10	40	12
80. Chrysene	SNA	28	<2
87. o-Dichlorobenzene	<10	250	<2
88. p-Dichlorobenzene	84	32	<2
98. Di-n-butyl phthalate	<10	31	230
108. Fluoranthene	<10	120	<2
109. Fluorene	21	53	<2
110. Hexachlorobenzene	61	<100	<10

SNA A standard is not available; the compound was searched using an NBS Library database of 42,000 compounds. The compound was not detected.
*Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-4 (Continued)

SAMPLE SET #4 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste K019 Concentration mg/kg (ppm)	Untreated Waste RCRA Blend* Concentration mg/kg (ppm)	Treated Waste Kiln Ash Concentration mg/kg (ppm)	Treated Waste Kiln Ash TCLP mg/L (ppm)
SEMIVOLATILES (Continued)				
111. Hexachlorobutadiene	<50	210	<10	
113. Hexachloroethane	94	<100	<10	
121. Naphthalene	360	<20	<2	
126. Nitrobenzene	<25	3,400	<5	
136. Pentachlorobenzene	64	<100	<10	
141. Phenanthrene	19	240	<2	
142. Phenol	<10	78	<2	
145. Pyrene	<10	200	<2	
148. 1,2,4,5-Tetrachlorobenzene	82	<50	<5	
150. 1,2,4-Trichlorobenzene	74	<50	<5	
Detected BDAT List Metal and Inorganic Constituents				
METALS				
154. Antimony	<6.0	24	<6.0	<0.060
155. Arsenic	<0.2	94	5.7	<0.002
156. Barium	<0.9	1.3	8.4	0.036
158. Cadmium	<0.3	<0.3	<0.3	0.005
159. Chromium	1.8	40	28	0.110
160. Copper	<1.0	165	1,270	1.940
161. Lead	2.4	27	25	0.320
163. Nickel	2.2	8.8	69	0.870
165. Silver	<0.9	<0.9	2.6	<0.009
167. Vanadium	<2.0	2.2	<2.0	<0.020
168. Zinc	9.4	4,170	11	0.056
INORGANICS				
169. Total Cyanide	<0.5	0.9	<0.47	
170. Fluoride	<5.0	31	3.2	
171. Sulfide	NA	830	<50	

NA = Not Analyzed.

* Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-4 (Continued)

SAMPLE SET #4 (Continued)

DESIGN AND OPERATING PARAMETERS

Parameter	Design	Operating Value
Kiln Temperature (^{o}F)+	*	1775-1900
Kiln Solids Residence Time (min)	*	120
Waste Feed Rate (MMBTU/hr)+	*	K019: 12.7 RCRA Blend, Waste Burner #1: 5.2-5.8 RCRA Blend, Waste Burner #2: 4.4-7.3
Kiln Rotational Speed (RPM)	*	0.19-0.21

*This information has been claimed as RCRA Confidential Business Information.

Table 4-5 TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - ROTARY KILN INCINERATOR

SAMPLE SET #5

Detected BDAT List Organic Constituents	Untreated Waste: K019 Concentration mg/kg (ppm)	Untreated Waste: RCRA Blend* Concentration mg/kg (ppm)	Treated Waste: Kiln Ash Concentration mg/kg (ppm)
VOLATILES			
4. Benzene	<2,000	2,000	<2
7. Carbon tetrachloride	4,000	<8	<2
9. Chlorobenzene	<2,000	<8	<2
14. Chloroform	6,000	<8	<2
22. 1,1-Dichloroethane	<2,000	<8	<2
23. 1,2-Dichloroethane	130,000	<8	<2
34. Methyl ethyl ketone	<10,000	940	<10
38. Methylene chloride	<10,000	910	<10
42. Tetrachloroethene	7,800	490	<2
43. Toluene	<2,000	2,300	<2
45. 1,1,1-Trichloroethane	45,000	130	<2
47. Trichloroethene	2,500	360	<2
215-217. Xylene (total)	<2,000	3,400	<2
222. Acetone	<10,000	1,200	<10
226. Ethyl benzene	<2,000	2,200	<2
229. Methyl isobutyl ketone	<10,000	1,100	<10
SEMIVOLATILES			
51. Acenaphthalene	<10	150	<2
57. Anthracene	<10	110	<2
65. Benzo(k)fluoranthene	<10	67	<2
68. Bis(2-chloroethyl) ether	340	<20	<2
70. Bis(2-ethylhexyl) phthalate	<10	40	<2
80. Chrysene	SNA	28	<2
87. o-Dichlorobenzene	<10	250	<2
88. p-Dichlorobenzene	90	32	<2
98. Di-n-butyl phthalate	<10	31	<2
108. Fluoranthene	<10	120	<2
109. Fluorene	19	53	<2
110. Hexachlorobenzene	87	<100	<10

SNA A standard is not available; the compound was searched using an NBS Library database of 42,000 compounds. The compound was not detected.

* Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-5 (Continued)

SAMPLE SET #5 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste K019 Concentration mg/kg (ppm)	Untreated Waste RCRA Blend* Concentration mg/kg (ppm)	Treated Waste Kiln Ash Concentration mg/kg (ppm)	Treated Waste Kiln Ash TCLP mg/L (ppm)
SEMIVOLATILES (Continued)				
111. Hexachlorobutadiene	<50	210	<10	
113. Hexachloroethane	113	<100	<10	
121. Naphthalene	371	<20	<2	
126. Nitrobenzene	<25	3,400	<5	
136. Pentachlorobenzene	63	<100	<10	
141. Phenanthrene	19	240	<2	
142. Phenol	<10	78	<2	
145. Pyrene	<10	200	<2	
148. 1,2,4,5-Tetrachlorobenzene	73	<50	<5	
150. 1,2,4-Trichlorobenzene	72	<50	<5	
Detected BDAT List Metal and Inorganic Constituents				
METALS				
154. Antimony	<6.0	24	9.1	<0.060
155. Arsenic	<0.2	94	3.9	<0.002
156. Barium	<0.9	1.3	21	0.054
158. Cadmium	0.36	<0.3	1.2	0.006
159. Chromium	3.2	40	125	0.210
160. Copper	2.1	165	2,780	2.140
161. Lead	2.5	27	86	0.290
163. Nickel	4.8	8.8	166	1.270
165. Silver	<0.9	<0.9	3.3	<0.009
167. Vanadium	<2.0	2.2	5.7	<0.020
168. Zinc	4.7	4,170	22	0.086
INORGANICS				
169. Total Cyanide	<0.5	0.9	<0.47	
170. Fluoride	<5.0	31	23	
171. Sulfide	NA	830	64	

NA = Not Analyzed.

*Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-5 (Continued)

SAMPLE SET #5 (Continued)

DESIGN AND OPERATING PARAMETERS

Parameter	Design	Operating Value
Kiln Temperature (°F)+	*	1775-1800
Kiln Solids Residence Time (min)	*	120
Waste Feed Rate (MMBTU/hr)+	*	K019: 11.7 RCRA Blend, Waste Burner #1: 5.5-6.0 RCRA Blend, Waste Burner #2: 5.2-9.7
Kiln Rotational Speed (RPM)	*	0.19-0.21

*This information has been claimed as RCRA Confidential Business Information.

Table 4-6 TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - ROTARY KILN INCINERATOR

SAMPLE SET #6

Detected BDAT List Organic Constituents	Untreated Waste: K019 Concentration mg/kg (ppm)	Untreated Waste: RCRA Blend* Concentration mg/kg (ppm)	Treated Waste: Kiln Ash Concentration mg/kg (ppm)
VOLATILES			
4. Benzene	<2,000	2,000	<2
7. Carbon tetrachloride	4,100	<8	<2
9. Chlorobenzene	<2,000	<8	<2
14. Chloroform	5,600	<8	<2
22. 1,1-Dichloroethane	<2,000	<8	<2
23. 1,2-Dichloroethane	98,000	<8	<2
34. Methyl ethyl ketone	<10,000	940	<10
38. Methylene chloride	<10,000	910	<10
42. Tetrachloroethene	6,900	490	<2
43. Toluene	<2,000	2,300	<2
45. 1,1,1-Trichloroethane	44,000	130	<2
47. Trichloroethene	2,500	360	<2
215-217. Xylene (total)	<2,000	3,400	<2
222. Acetone	<10,000	1,200	<10
226. Ethyl benzene	<2,000	2,200	<2
229. Methyl isobutyl ketone	<10,000	1,100	<10
SEMIVOLATILES			
51. Acenapthalene	<10	150	<2
57. Anthracene	<10	110	<2
65. Benzo(k)fluoranthene	<10	67	<2
68. Bis(2-chloroethyl) ether	330	<20	<2
70. Bis(2-ethylhexyl) phthalate	<10	40	<2
80. Chrysene	SNA	28	<2
87. o-Dichlorobenzene	<10	250	<2
88. p-Dichlorobenzene	90	32	<2
98. Di-n-butyl phthalate	<10	31	<2
108. Fluoranthene	<10	120	<2
109. Fluorene	22	53	<2
110. Hexachlorobenzene	66	<100	<10

SNA A standard is not available; the compound was searched using an NBS Library database of 42,000 compounds. The compound was not detected.

* Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-6 (Continued)

SAMPLE SET #6 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste K019 Concentration mg/kg (ppm)	Untreated Waste RCRA Blend* Concentration mg/kg (ppm)	Treated Waste Kiln Ash Concentration mg/kg (ppm)	Treated Waste Kiln Ash TCLP mg/L (ppm)
SEMIVOLATILES (Continued)				
111. Hexachlorobutadiene	<50	210	<10	
113. Hexachloroethane	88	<100	<10	
121. Naphthalene	390	<20	<2	
126. Nitrobenzene	<25	3,400	<5	
136. Pentachlorobenzene	65	<100	<10	
141. Phenanthrene	17	240	<2	
142. Phenol	<10	78	<2	
145. Pyrene	<10	200	<2	
148. 1,2,4,5-Tetrachlorobenzene	86	<50	<5	
150. 1,2,4-Trichloroenzene	79	<50	<5	
Detected BDAT List Metal and Inorganic Constituents				
METALS				
154. Antimony	<6.0	24	9.6	< 0.06
155. Arsenic	<0.2	94	2.3	<0.002
156. Barium	<0.9	1.3	11	0.027
158. Cadmium	0.62	<0.3	2.2	0.006
159. Chromium	5.3	40	141	0.092
160. Copper	3.6	165	2,520	2.400
161. Lead	3.5	27	34	0.270
163. Nickel	6.0	8.8	288	0.690
165. Silver	<0.9	<0.9	3.1	<0.009
167. Vanadium	<2.0	2.2	8.7	<0.020
168. Zinc	8.4	4,170	13	0.061
INORGANICS				
169. Total Cyanide	<0.5	0.9	<0.47	
170. Fluoride	<5.0	31	4.7	
171. Sulfide	NA	830	92	

NA = Not Analyzed.

*Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-6 (Continued)

SAMPLE SET #6 (Continued)

DESIGN AND OPERATING PARAMETERS

Parameter	Design	Operating Value
Kiln Temperature (°F)-	*	1775-1850
Kiln Solids Residence Time (min)	*	120
Waste Feed Rate (MMBTU/hr)-	*	K019: 11.5 RCRA Blend, Waste Burner #1: 5.2-5.8 RCRA Blend, Waste Burner #2: 5.2-9.7
Kiln Rotational Speed (RPM)	*	0.19-0.21

*This information has been claimed as RCRA Confidential Business Information.

5. DETERMINATION OF BEST DEMONSTRATED AVAILABLE TECHNOLOGY (BDAT)

This section presents the Agency's rationale for determining best demonstrated available technology (BDAT) for K073 nonwastewaters and wastewaters.

To determine BDAT, the Agency examines all available performance data on technologies that are identified as demonstrated to determine (using statistical techniques) whether one or more of the technologies performs significantly better than the others. All performance data used for determination of best technology must first be adjusted for accuracy, as discussed in EPA's publication Methodology for Developing BDAT Treatment Standards. (An accuracy adjustment accounts for the ability of an analytical technique to recover a particular constituent from the waste in a particular test. The recovery of a constituent is usually determined by spiking a sample with a known amount of the target constituent and then comparing the spiked sample amounts with results from unspiked samples.) BDAT must be specifically defined for all streams associated with the management of the listed waste or wastes; this pertains to the original waste as well as any residual waste streams created by the treatment process. Additionally, the ANOVA test is available to compare two or more demonstrated technologies and determine which offers the best treatment. The ANOVA test is described fully in the methodology background document (USEPA 1989a).

The technology that performs best, based on ANOVA tests, on a particular waste or waste treatability group is then evaluated to determine whether it is "available." To be available, the technology must (1) be commercially available to any generator and (2) provide "substantial" treatment of the waste, as determined through evaluation of accuracy-adjusted data. In determining whether treatment is substantial, EPA may consider data on the performance of a waste similar to the waste

in question provided that the similar waste is at least as difficult to treat. If the best technology is found to be not available, then the next best technology is evaluated, and so on.

Incineration is the only technology identified as demonstrated for K019 and, consequently, K073 waste (see Section 4). EPA has determined in Section 3 that incineration is commercially available and demonstrated on a waste similar to K073. Also, EPA believes that incineration provides substantial treatment because no constituents in K019 have boiling points higher than those of the constituents of concern in K073. These K019 constituents have been reduced to nondetectable levels; therefore, the constituents that are regulated in K073 can be reduced to nondetectable levels in the residual nonwastewater ash and in the residual wastewater stream (the scrubber water). Thus, incineration is "best."

As "best," "demonstrated," and "available," incineration is therefore BDAT for K073 waste.

6. SELECTION OF REGULATED CONSTITUENTS

This section presents the methodology and rationale for the selection of regulated constituents for the treatment of K073.

Generally, constituents selected for regulation must satisfy the following criteria:

1. They must be on the BDAT list of regulated constituents. (Presence on the BDAT list implies the existence of approved techniques for analyzing the constituent in treated waste matrices.)

2. They must be present in, or be suspected of being present in, the untreated waste. For example, in some cases, analytical difficulties (such as masking) may prevent a constituent from being identified in the untreated waste, but its identification in a treatment residual may lead the Agency to conclude that it is present in the untreated waste.

3. Where performance data are transferred, the selected constituents must be easier to treat than the waste constituent(s) from which performance data are transferred. Factors for assessing ease of treatment vary according to the technology of concern. For instance, for incineration the factors include bond dissociation energy, thermal conductivity, and boiling point.

From the group of constituents that are eligible to be regulated (i.e., all constituents on the BDAT list), EPA may select a subset of constituents as representative of the broader group. For example, out of a group of constituents that react similarly to treatment, the Agency might name only those that are the most difficult to treat as regulated constituents for the purpose of setting a standard.

6.1 Identification of BDAT List Constituents

As discussed in Sections 2 and 4, the Agency has no performance data from treatment of K073 by incineration. Compositional data were obtained

from the Listing Background Document for this waste and The Chlorine Institute, Inc.. Performance data are available for K019, which the Agency believes is similar to K073 because they both contain carbon tetrachloride, chloroform, hexachloroethane, tetrachloroethene, and 1,1,1-trichloroethane and therefore represents a source of transfer. These data, along with information on the K073 waste-generating process, have been used to determine which BDAT list constituents are or may be present in the waste and thus which ones are potential candidates for regulation. Table 6-1 indicates, for the untreated waste, which constituents the Agency believes may be present. These 11 constituents were considered as candidates for regulation.

6.2 Constituent Selection

The Agency has regulated 5 of the 11 candidates believed to be present in K073. The constituents are carbon tetrachloride, chloroform, hexachloroethane, tetrachloroethene, and 1,1,1-trichloroethane. These constituents are those that are believed to be present in the highest concentrations.

Although other constituents appear in the compositional data for K073, they are present at much lower concentrations than the five constituents to be regulated. The Agency, therefore, believes that incineration will destroy these other constituents as well as those that are regulated.

Table 6-1 Potential Candidates for Regulation

Constituent
Volatile organics
Carbon tetrachloride[a]
Chloroform[a]
Hexachloroethane[a]
Tetrachloroethene[a]
1,1,1-Trichloroethane[a]
Pentachloroethane
Tetrachloroethylene
Dichloroethylene
1,1,2,2-Tetrachloroethane
Various chlorinated propanes

[a]These constituents are selected for regulation.

7. CALCULATION OF BDAT TREATMENT STANDARDS

The Agency bases numerical treatment standards for regulated constituents on the performance of well-designed and well-operated BDAT treatment systems. These standards must account for analytical limitations in available performance data and must be adjusted for variabilities related to treatment, sampling, and analytical techniques and procedures.

Concentration-based BDAT standards are determined for each constituent by multiplying the arithmetic mean of accuracy-adjusted constituent concentrations detected in the treated waste by a "variability factor" specific to each constituent. Accuracy adjustment of performance data was discussed in Section 5 in relation to defining "substantial treatment." Variability factors correct for normal variations in the performance of a particular technology over time. They are designed to reflect the 99th percentile level of performance that the technology achieves in commercial operation.

Where EPA has identified BDAT for a particular waste, but because of data limitations or for some other compelling reason cannot define specific treatment standards for that waste, the Agency can require the use of that treatment process as a technology standard. Similarly, where there are no known generators of a waste, or where EPA believes that the waste can be totally recycled or reused as a raw material, the Agency may specify a "no land disposal" standard, which effectively amounts to setting the performance standard at zero for all waste constituents.

In the case of K073 waste, the Agency is setting treatment standards for the organic constituents shown in Tables 7-1 and 7-2 at the end of this section. These treatment standards are based on the performance data from incineration of K019 waste (see Tables 4-1 through 4-6).

The accuracy-adjusted concentration for Tables 7-1 and 7-2 constituents is the analytical result multiplied by a correction factor.

After treatment performance data are corrected for accuracy, the arithmetic average of the corrected data is calculated for each constituent. In cases where the constituent is not detected above its detection limit, the detection limit is used to calculate the average constituent concentration in the treated waste. The next step in calculating treatment standards is to determine the variability factor for each regulated constituent.

EPA is using a variability factor of 2.8 for all treatment standard calculations for K073 nonwastewaters because treatment performance data for each constituent transferred from K019 was below the detection limit in the K019 incinerator ash. The variability factors for constituents in K073 wastewaters are also all 2.8 because the treatment performance for each constituent transferred from K019 was below the detection limit in the incinerator scrubber water. EPA's publication Methodology for Developing BDAT Treatment Standards details both accuracy adjustment and the determination and use of variability factors.

Table 7-3 summarizes all treatment standards being established for K073 waste. Note that concentrations are expressed in terms of mg/kg and mg/l for nonwastewaters and wastewaters, respectively.

Table 7-1 Calculation of Nonwastewater Treatment Standards for Constituents Proposed for Regulation in K073 Waste

Constituent	Treated average nonwastewater concentration (mg/kg)	Analytical recovery (%)	Correction factor (reciprocal of analytical recovery)	Corrected analytical values	Variability factor	Treatment standard (mg/kg)
Volatile organics						
Carbon tetrachloride	<2.0	91	1.1	2.2	2.8	6.2
Chloroform	<2.0	91	1.1	2.2	2.8	6.2
Tetrachloroethene	<2.0	91	1.1	2.2	2.8	6.2
1,1,1-Trichloroethane	<2.0	91	1.1	2.2	2.8	6.2
Semivolatile organics						
Hexachloroethane	<10.0	103	1.0*	10.0	2.8	30

*For recoveries greater than 100%, the Agency is using a maximum value of 100%. The correction factor (the reciprocal of the analytical recovery) is therefore 1.0.

Table 7-2 Calculation of Wastewater Treatment Standards for Constituents Proposed for Regulation in K073 Waste

Constituent	Treated average wastewater concentration (mg/kg)	Analytical recovery (%)	Correction factor (reciprocal of analytical recovery)	Corrected analytical values	Variability factor	Treatment standard (mg/kg)
Carbon tetrachloride	0.0175	86	1.16	0.0204	2.8	0.057
Chloroform	0.0124	100	1.0	0.0124	3.71	0.046
Tetrachloroethene	0.0011	100	1.0	0.0011	5.35	0.056
1,1,1-Trichloroethane	0.001	100	1.0	0.001	5.35	0.007
Semivolatile organics						
Hexachloroethane	0.0138	70.5	1.42	0.0196	2.8	0.055

Table 7-3 Treatment Standards for K073 Waste

Constituent	Nonwastewaters Total concentration (mg/kg) (grab sample)	Wastewaters Total concentration (mg/l) (composite sample)
Volatile organics		
Carbon tetrachloride	6.2	0.057
Chloroform	6.2	0.046
Tetrachloroethene	6.2	0.056
1,1,1,-Trichloroethane	6.2	0.054
Semivolatile organics		
Hexachloroethane	30	0.055

NA = Not applicable.

8. REFERENCES

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USEPA. 1989b. U.S. Environmental Protection Agency, Office of Solid Waste. Treatment technology background document. Washington, D.C.: U.S. Environmental Protection Agency.

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APPENDIX A

WASTEWATER STANDARDS FROM U AND P WASTES (USEPA 1990)

Carbon Tetrachloride (U221). The data available for carbon tetrachloride were compiled from the WERL database, BDAT Solvents Rule data, and literature WAO and PACT® data. These data are presented in Table 4-9. Demonstrated treatment technologies included AL, AS, AS+Fil, AirS, BT, chemically assisted clarification (CAC), GAC, PACT®, RO, SS, and WOx. The treatment performance data represents bench-, pilot, and full-scale studies. The resulting effluent concentrations ranged from 0.200 ppb to 12,000 ppb.

The proposed and promulgated BDAT standard was set using BT technology and an achievable effluent of 10 ppb. BT was selected as BDAT because it represents full-scale data developed from ITD sampling and was used as part of the BDAT Solvents Rule. The effluent concentration achievable by this technology is supported by similar effluent concentrations from the SS and GAC treatment performance data.

The resulting BDAT treatment standard for carbon tetrachloride is 0.057 ppm as shown in Table 6-10.

TABLE 4-9
WASTEWATER TREATMENT PERFORMANCE DATA
FOR CARBON TETRACHLORIDE

TECHNOLOGY	TECHNOLOGY SIZE	FACILITY	DETECTION LIMIT (ppb)	RANGE INFLUENT CONCENTRATION (ppb)	NO. OF DATA POINTS	AVERAGE EFFLUENT CONCENTRATION (ppb)	RECOVERY (%)	REMOVAL (%)	REFERENCE
AL	Pilot	203A		0-100	14	11.000		84	WERL
AL	Pilot	203A		0-100	14	15.000		78	WERL
AS	Pilot	203A		0-100	14	13.000		81	WERL
AS	Full	1B		100-1000	6	16.000		88	WERL
AS	Pilot	206B		0-100	20	0.200		99.67	WERL
AS	Full	975B		0-100		3.000		94.8	WERL
AS	Bench	202D		10000-100000		130.000		99.32	WERL
AS	Full	6B		100-1000	3	10.000		96.7	WERL
AS	Pilot	241B		100-1000	5	5.000		98.3	WERL
AS	Pilot	240A		0-100	12	4.000		90.7	WERL
AS+Fil	Full	6B		1000-10000	14	10.000		99.09	WERL
AS+Fil	Full	6B		10000-100000	2	10.000		99.96	WERL
AirS	Bench	1328E		10000-100000	5	7600.000		89	WERL
* BT	Full	P225		51-44000	17	10.000			BDAT # *
BT	Full	REF4		95	1	5.500			BDAT #
CAC	Pilot	203A		100-1000	14	101.000		0	WERL
GAC	Full	1264B		0-100		1.000		87	WERL
GAC	Full	237A		0-100	1	10.000		89	WERL
PACT	Bench	242E		1000-10000		30.000		98.5	WERL
PACT	Bench	Zimpro		860	1	1.000		99.9	WAO
PACT	Bench	Zimpro		2000	1	30.000		98.5	WAO
RO	Pilot	323B		100-1000	1	2.000		98	WERL
SCOx	Pilot	65D		100-1000		20.000		96.5	WERL
SS	Full	251B		10000-100000	10	5.000		99.99	WERL
SS	Full	251B		1000-10000	10	10.000		99.41	WERL
TF	Pilot	203A		0-100	14	26.000		62	WERL
TF	Pilot	240A		0-100	12	4.000		90.7	WERL
WOx	Bench	Zimpro		4330000	1	12000.000		99.7	WAO
WOx	Full	242E		1000000		2000.000		99.92	WERL

ITD data presented in the BDAT Solvents Rule F001-F005 Background Document.

Chloroform (U044). Several sources of wastewater treatment performance data were available for chloroform including data from the ITD, and WERL databases and literature WAO and PACT® data. These data are presented in Table 4-15. Demonstrated treatment technologies included AL, AS, AS+Fil, AirS, CAC, CAC+AirS, chemical oxidation (ChOx), GAC, PACT®, RO, SS, TF, and WOx. The treatment performance data represents bench-, pilot-, and full-scale data.

The treatment performance data available from the ITD database were used for setting the proposed and promulgated BDAT standard for this constituent for the following reasons:

(1) The ITD data represent treatment performance data from the OCPSF sampling episodes. The data collected by ITD include long-term sampling of several industries. These data are therefore a good reflection of the total organic chemical industry and can adequately represent a wastewater of unknown characteristics.

(2) The ITD data were carefully screened prior to inclusion in that database. These data were used in determining an ITD promulgated limit.

(3) A promulgated ITD limit represents data that have undergone both EPA and industry review and acceptance.

The BDAT for chloroethane is SS and using the ITD median long term average and ITD Option 1 variability factors, a BDAT treatment standard equal to the ITD limit was calculated as shown in Table 4-173. The BDAT treatment standard for chloroethane is 0.046 ppm.

TABLE 4-15
WASTEWATER TREATMENT PERFORMANCE DATA
FOR CHLOROFORM

TECHNOLOGY	TECHNOLOGY SIZE	FACILITY	DETECTION LIMIT (ppb)	RANGE INFLUENT CONCENTRATION (ppb)	NO. OF DATA POINTS	AVERAGE EFFLUENT CONCENTRATION (ppb)	RECOVERY (%)	REMOVAL (%)	REFERENCE
AL	Full	1607B		0-100	3	9.000		90.1	WERL
AL	Full	1B		100-1000	6	26.000		96.8	WERL
AL	Pilot	203A		100-1000	14	53.000		61	WERL
AL	Full	141A		100-1000		16.000		92.3	WERL
AL	Full	1607B		100-1000	2	10.000		97.4	WERL
AL	Full	1607B		100-1000	3	130.000		86	WERL
AL	Pilot	203A		100-1000	14	31.000		77	WERL
AS	Full	1B		0-100	3	20.000		80	WERL
AS	Full	6B		100-1000	7	30.000		77	WERL
AS	Full	1B		0-100	5	6.000		86	WERL
AS	Full	6B		100-1000	3	10.000		97.7	WERL
AS	Bench	202D		10000-100000		200.000		99.43	WERL
AS	Full	234A		0-100		1.200		61	WERL
AS	Full	1B		0-100	6	21.000		62	WERL
AS	Full	375E		0-100	7	1.000		75	WERL
AS	Full	1B		100-1000	6	59.000		51	WERL
AS	Full	975B		0-100		2.000		93.8	WERL
AS	Full	234A		0-100		2.300		72	WERL
AS	Full	234A		0-100		0.500		98.4	WERL
AS	Full	6B		100-1000	3	10.000		98.2	WERL
AS	Full	238A		0-100	3	2.400		46	WERL
AS	Full	1607B		100-1000	3	50.000		86	WERL
AS	Full	1607B		1000-10000	2	40.000		96.9	WERL
AS	Pilot	206B		100-1000	20	3.600		97.4	WERL
AS	Full	375E		0-100	7	20.000		78	WERL
AS	Full	1587E		0-100		1.600		65	WERL
AS	Pilot	241B		100-1000	5	44.000		85	WERL
AS	Full	234A		0-100		1.300		84	WERL
AS	Pilot	203A		100-1000	14	18.000		87	WERL
AS	Full	6B		1000-10000	27	19.000		98.7	WERL
AS	Full	201B		0-100	29	38.000		53	WERL
AS	Full	234A		0-100		1.300		65	WERL
AS	Pilot	240A		0-100	14	2.000		98	WERL
AS+Fil	Full	6B		1000-10000	3	10.000		99.41	WERL
AS+Fil	Full	6B		100-1000	14	10.000		95.8	WERL
AirS	Bench	1328E		100000-1000000	5	16000.000		93.1	WERL
AirS	Pilot	369A		0-100		1.400		98.2	WERL
AirS	Pilot	213B		0-100	1	13.000		77	WERL
AirS	Bench	1328E		10000-100000	5	4400.000		83	WERL

TABLE 4-15 (Continued)
WASTEWATER TREATMENT PERFORMANCE DATA
FOR CHLOROFORM

TECHNOLOGY	TECHNOLOGY SIZE	FACILITY	DETECTION LIMIT (ppb)	RANGE INFLUENT CONCENTRATION (ppb)	NO. OF DATA POINTS	AVERAGE EFFLUENT CONCENTRATION (ppb)	RECOVERY (%)	REMOVAL (%)	REFERENCE
AirS	Pilot	225B		0-100	1	0.130		98.9	WERL
AirS	Bench	17A		0-100		2.600		96.9	WERL
AirS	Bench	17A		1000-10000		110.000		91.7	WERL
AirS	Bench	17A		0-100		3.900		88	WERL
AirS	Bench	17A		100-1000		4.200		98.6	WERL
AirS	Pilot	210B		100-1000	1	1.000		99.2	WERL
AirS	Bench	17A		100-1000		3.700		98.6	WERL
AirS	Bench	1328E		100-1000	5	34.000		84	WERL
AirS	Pilot	434B		1000-10000	4	41.000		98	WERL
CAC	Pilot	203A		100-1000	14	106.000		22	WERL
CAC+AirS	Full	1833D		0-100	25	0.200		89	WERL
ChOx	Bench	640E		100-1000	2	7.000		96	WERL
ChOx	Bench	640E		100-1000	1	3.000		99	WERL
ChOx (Oz)	Pilot	331D		0-100		46.000		37	WERL
ChOx (Oz)	Pilot	331D		0-100		2.800		35	WERL
GAC	Full	1264B		0-100		1.000		87	WERL
GAC	Pilot	331D		0-100		1.000		98.6	WERL
GAC	Full	245B		100-1000	1	10.000		97.6	WERL
GAC	Full	237A		100-1000	1	10.000		98.1	WERL
GAC	Full	245B		100-1000	1	10.000		96.2	WERL
PACT	Bench	242E		0-100		20.000		47	WERL
PACT	Bench	Zimpro		1470	1	1.000		99.9	WAO
PACT	Bench	Zimpro		38	1	20.000		47	WAO
RO	Pilot	180A		0-100		0.890		71	WERL
RO	Full	250B		1000-10000		110.000		94.5	WERL
RO	Full	250B		100-1000		53.000		87	WERL
SCOx	Pilot	65D		100-1000		1.700		99.83	WERL
* SS	Full	415T	10	7330-1088000	15	10.500			ITD-L *
* SS	Full	913	10	28700-200000	14	129.200			ITD-L *
SS	Full	6B		100000-1000000	15	10.000		99.99	WERL
SS	Full	6B		10000-100000	2	120.000		99.88	WERL
SS	Full	251B		1000000	10	6000.000		99.99	WERL
SS	Full	251B		100000-1000000	10	9600.000		96.4	WERL
TF	Pilot	240A		0-100	14	11.000		89	WERL
TF	Full	1B		0-100	4	14.000		86	WERL
TF	Pilot	203A		100-1000	14	102.000		24	WERL
WOx	Bench	Zimpro		4450000	1	3000.000		99.9	WAO
WOx	Bench	Zimpro		270000	1	1000.000		99	WAO

Tetrachloroethene (U210). Several sources of wastewater treatment performance data were available for tetrachloroethene, including data from the ITD and WERL databases, BDAT Solvents Rule data, and literature PACT[R] data. These data are presented in Table 4-39. Demonstrated treatment technologies included AL, AS, AS+Fil, Airs, AnFF, BT, CAC+AirS, ChOX, chemical reduction (Chred), GAC, PACT[R], RO, SS, TF, and WOx. The treatment performance data represents bench-, pilot-, and full-scale studies.

The treatment performance data available from the ITD database were used for setting the proposed and promulgated BDAT standard for this constituent for the following reasons:

(1) The ITD data represent treatment performance data from the OCPSF sampling episodes. The data collected by ITD include long-term sampling of several industries. These data are therefore a good reflection of the total organic chemical industry and can adequately represent a wastewater of unknown characteristics.

(2) The ITD data were carefully screened prior to inclusion in that database. These data were used in determining an ITD promulgated limit.

(3) A promulgated ITD limit represents data that have undergone both EPA and industry review and acceptance.

The BDAT for tetrachloroethylene is SS and using the ITD median long term average and ITD Option 1 variability factor, a BDAT treatment standard equal to the ITD limit was calculated as shown in Table 4-173. The BDAT treatment standard for tetrachloroethene is 0.056 ppm.

TABLE 4-39
WASTEWATER TREATMENT PERFORMANCE DATA
FOR TETRACHLOROETHYLENE

TECHNOLOGY	TECHNOLOGY SIZE	FACILITY	DETECTION LIMIT (ppb)	RANGE INFLUENT CONCENTRATION (ppb)	NO. OF DATA POINTS	AVERAGE EFFLUENT CONCENTRATION (ppb)	RECOVERY (%)	REMOVAL (%)	REFERENCE
AL	Full	1B		0-100	6	10.000		80	WERL
AS	Full	1B		0-100	3	10.000		83	WERL
AS	Full	1B		0-100	5	2.000		97.5	WERL
AS	Full	1B		0-100	4	8.000		85	WERL
AS	Full	238A		0-100	3	2.100		87	WERL
AS	Full	1587E		0-100		0.870		97.8	WERL
AS	Full	234A		0-100		22.000		49	WERL
AS	Full	238A		0-100	3	1.600		87	WERL
AS	Full	1B		0-100	4	1.000		96	WERL
AS	Full	234A		100-1000		3.900		96.7	WERL
AS	Full	1B		0-100	5	9.000		75	WERL
AS	Full	1B		100-1000	5	5.000		96.7	WERL
AS	Full	1B		0-100	3	22.000		45	WERL
AS	Full	1B		0-100	6	28.000		71	WERL
AS	Pilot	241B		100-1000	5	11.000		95.3	WERL
AS	Full	1B		1000-10000	6	440.000		85	WERL
AS	Full	201B		0-100	22	8.000		89.5	WERL
AS	Full	1B		0-100	4	6.000		93	WERL
AS	Full	1B		100-1000	6	48.000		79	WERL
AS	Full	1B		100-1000	6	26.000		78	WERL
AS	Full	234A		0-100		0.600		95.9	WERL
AS	Full	1B		0-100	6	8.000		85	WERL
AS	Full	1B		0-100	5	14.000		74	WERL
AS	Full	1B		100-1000	4	100.000		83	WERL
AS+Fil	Full	6B		10000-100000	3	230.000		99.04	WERL
AS+Fil	Full	6B		100-1000	15	11.000		97.7	WERL
AirS	Pilot	221B		0-100	1	0.500		95.8	WERL
AirS	Pilot	71D		0-100	1	0.200		98.7	WERL
AirS	Full	223B		100-1000	1	0.800		99.43	WERL
AirS	Pilot	222B		0-100	1	0.200		94.3	WERL
AirS	Pilot	217B		100-1000	1	0.300		99.73	WERL
AirS	Pilot	207B		0-100	1	0.500		98.3	WERL
AirS	Full	69A		0-100		0.960		98.4	WERL
AirS	Pilot	220B		0-100	1	0.200		99.76	WERL
AirS	Pilot	208B		0-100	1	0.200		99.17	WERL
AirS	Pilot	1363E		0-100		0.200		97.1	WERL
AirS	Pilot	214B		100-1000	1	0.900		99.31	WERL
AirS	Full	1042E		100-1000		0.500		99.71	WERL
AirS	Full	322B		100-1000	9	1.200		99.75	WERL
AirS	Pilot	1362E		1000-10000	3	5.000		99.74	WERL
AnFF	Bench	724D		10000-100000		4.400		99.99	WERL

TABLE 4-39 (Continued)
WASTEWATER TREATMENT PERFORMANCE DATA
FOR TETRACHLOROETHYLENE

(continued)

TECHNOLOGY	TECHNOLOGY SIZE	FACILITY	DETECTION LIMIT (ppb)	RANGE INFLUENT CONCENTRATION (ppb)	NO. OF DATA POINTS	AVERAGE EFFLUENT CONCENTRATION (ppb)	RECOVERY (%)	REMOVAL (%)	REFERENCE
BT	Full	P225		95-31500	18	47.000			BDAT #
BT	Full	P280		110-1748	12	10.000			BDAT #
BT	Full	REF4		62	1	7.300			BDAT #
CAC+AirS	Full	1833D		0-100	7	0.100		89	WERL
ChOx	Pilot	2026A		0-100	4	2.000		86	WERL
ChOx	Pilot	2026A		0-100	4	1.700		84	WERL
Chred	Bench			250	1	5.000			ART
GAC	Full	1264B		0-100		1.000		95.2	WERL
GAC	Full	245B		1000-10000	1	10.000		99.13	WERL
GAC	Full	237A		100-1000	1	10.000		96.3	WERL
PACT	Bench	242E		100-1000		10.000		92.6	WERL
PACT	Bench	Zimpro		304		1.000		99.7	WAO
PACT	Bench	Zimpro		136	1	10.000		93	WAO
RO	Pilot	323B		0-100	1	30.000		68	WERL
RO	Pilot	180A		0-100		0.250		81	WERL
* SS	Full	913	10	10800-241000	14	18.400			ITD-L *
SS	Full	251B		1000-10000	10	10.000		99.29	WERL
SS	Full	6B		10000-100000	2	10.000		99.95	WERL
TF	Full	1B		0-100	5	12.000		81	WERL
TF	Full	1B		100-1000	5	26.000		83	WERL
TF	Full	1B		0-100	3	18.000		54	WERL
TF	Full	1B		0-100	4	1.000		96.9	WERL
TF	Full	1B		0-100	6	6.000		92.7	WERL
TF	Full	1B		0-100	5	3.000		94.3	WERL
UV (B)	Bench	1138E		0-100	1	7.500		85	WERL
WOx		REF10		41000	1	1000.000			BDAT #
WOx	Pilot	78D		1000000		900.000		99.98	WERL

ITD data presented in the BDAT Solvents Rule F001-F005 Background Document.

1,1,1-Trichloroethane (U226). Several sources of wastewater treatment performance data were available for 1,1,1-trichloroethane, including data from the ITD and WERL databases, BDAT Solvents Rule data, and literature WAO data. These data are presented in Table 4-42. Demonstrated treatment technologies included AL, AS, AirS, BT, GAC, PACT®, RO, SS, TF, and WOx. The treatment performance data represents bench-, pilot-, and full-scale studies.

The treatment performance data available from the ITD database were used for setting the proposed and promulgated BDAT standard for this constituent for the following reasons:

(1) The ITD data represent treatment performance data from the OCPSF sampling episodes. The data collected by ITD include long-term sampling of several industries. These data are therefore a good reflection of the total organic chemical industry and can adequately represent a wastewater of unknown characteristics.

(2) The ITD data were carefully screened prior to inclusion in that database. These data were used in determining an ITD promulgated limit.

(3) A promulgated ITD limit represents data that have undergone both EPA and industry review and acceptance.

The BDAT for 1,1,1-trichloroethane is SS and using the ITD median long term average and ITD Option 1 variability factor, a BDAT treatment standard equal to the ITD limit was calculated as shown in Table 4-173. The BDAT treatment standard for 1,1,1-trichloroethane is 0.54 ppm.

TABLE 4-42
WASTEWATER TREATMENT PERFORMANCE DATA
FOR 1,1,1-TRICHLOROETHANE

TECHNOLOGY	TECHNOLOGY SIZE	FACILITY	DETECTION LIMIT (ppb)	RANGE INFLUENT CONCENTRATION (ppb)	NO. OF DATA POINTS	AVERAGE EFFLUENT CONCENTRATION (ppb)	RECOVERY (%)	REMOVAL (%)	REFERENCE
AL	Full	1B		0-100	5	10.000		90	WERL
AS	Full	201B		0-100	6	21.000		79	WERL
AS	Full	1B		0-100000	4	10.000		89	WERL
AS	Full	234A		1000-10000		1.300		99.88	WERL
AS	Full	1B		1000-10000	6	850.000		87	WERL
AS	Full	1B		0-100	5	9.000		84	WERL
AS	Full	1B		0-100	4	10.000		84	WERL
AS	Full	1B		0-100	5	10.000		81	WERL
AS	Full	1B		100-1000	6	12.000		90	WERL
AS	Full	6B		100-1000	3	10.000		98.9	WERL
AS	Full	375E		0-100	7	1.000		92.3	WERL
AS	Full	1B		0-100	4	12.000		87	WERL
AS	Full	975B		100-1000		4.000		98.1	WERL
AS	Full	234A		0-100		1.000		97.6	WERL
AS	Pilot	206B		100-1000	20	0.300		99.77	WERL
AS	Full	1B		100-1000	5	54.000		89	WERL
AS	Full	1B		100-1000	6	5.000		96.2	WERL
AS	Full	1B		0-100	6	30.000		39	WERL
AS	Full	1B		0-100	4	5.000		95	WERL
AS	Full	1B		100-1000	6	28.000		94.3	WERL
AS	Full	234A		0-100		1.300		76	WERL
AS	Full	238A		0-100	3	2.200		85	WERL
AS	Full	234A		0-100		1.300		73	WERL
AS	Full	1B		0-100	3	2.000		95.8	WERL
AS	Full	238A		0-100	3	2.900		77	WERL
AS	Full	1587E		100-1000		0.270		99.73	WERL
AS	Full	1B		100-1000	5	100.000		70	WERL
AS	Full	375E		0-100	7	1.000		92.3	WERL
AS	Full	1B		0-100	3	7.000		83	WERL
AS	Full	1B		0-100	3	8.000		84	WERL
AS	Full	1B		0-100	3	2.000		95.8	WERL
AS	Pilot	241B		100-1000	5	8.000		97.2	WERL
AS	Full	1B		0-100	5	1.000		98.4	WERL
AS	Full	1B		0-100	3	4.000		88	WERL
AS	Full	234A		0-100		1.300		88	WERL
AS	Bench	202D		100000-1000000		1600.000		98.6	WERL
AS	Pilot	REF6		237	1	23.000			BDAT #
AS	Pilot	REF2		150000	6	48683.000			BDAT #

ITD data presented in the BDAT Solvents Rule F001-F005 Background Document.

TABLE 4-42 (Continued)
WASTEWATER TREATMENT PERFORMANCE DATA
FOR 1,1,1-TRICHLOROETHANE

TECHNOLOGY	TECHNOLOGY SIZE	FACILITY	DETECTION LIMIT (ppb)	RANGE INFLUENT CONCENTRATION (ppb)	NO. OF DATA POINTS	AVERAGE EFFLUENT CONCENTRATION (ppb)	RECOVERY (%)	REMOVAL (%)	REFERENCE
AirS	Pilot	211B		0-100	1	1.000		98.8	WERL
AirS	Pilot	207B		0-100	1	0.500		97.5	WERL
AirS	Pilot	812E		1000-10000		49.000		95.9	WERL
AirS	Pilot	222B		100-1000	1	1.100		99.75	WERL
AirS	Pilot	812E		0-100		3.000		92.9	WERL
AirS	Pilot	211B		100-1000	1	1.700		99.5	WERL
AirS	Pilot	1362E		1000-10000	3	130.000		97.8	WERL
AirS	Pilot	812E		100-1000		12.000		89	WERL
AirS	Pilot	217B		0-100	1	0.300		97	WERL
AirS	Pilot	205E		100-1000		7.000		96.8	WERL
AirS	Full	1344E		100-1000		0.200		99.98	WERL
AirS	Pilot	219B		0-100	1	0.500		96.7	WERL
BT	Full	P240		10-215	3	10.000			BDAT #
GAC	Bench	1362E		10-100		1.000		99.99	WERL
GAC	Full	1264B		0-100		1.000		96.6	WERL
GAC	Full	1264B		100-1000		1.000		99.35	WERL
GAC	Pilot	812E		100-1000		1.000		99.05	WERL
PACT	Bench	242E		100-1000		25.000		93.8	WERL
PACT	Bench	Zimpro		4970	1	1.000		99.9	WAO
PACT	Bench	Zimpro		405	1	25.000		93.8	WAO
RO	Pilot	180A		0-100		0.050		98.2	WERL
RO	Full	250B		100-1000		36.000		95.6	WERL
RO	Pilot	323B		0-100	1	2.000		97.8	WERL
RO	Full	250B		100-1000		10.000		93.8	WERL
SS	Full	6B		10000-100000		10.000		99.94	WERL
* SS	Full	913	10	11900-35000	14	10.000			ITD-L *
SS	Pilot	REF2		150000	5	463.000			BDAT #
TF	Full	375E		0-100	7	1.000		50	WERL
TF	Full	1B		0-100	5	2.000		92.6	WERL
TF	Full	1B		100-1000	6	2.000		98.3	WERL
TF	Full	1B		0-100	5	5.000		92.2	WERL
UV [B]	Bench	1138E		0-100		30.000		40	WERL
WOx		REF10		370000	1	1000.000			BDAT #
WOx	Full	Zimpro	50	6900-9600	2				WAO
WOx	Full	242E		100000-1000000		400.000		99.96	WERL

ITD data presented in the BDAT Solvents Rule F001-F005 Background Document.

Hexachloroethane (U131). The data available for hexachloroethane were compiled from the WERL database and are presented in Table 4-97. Demonstrated treatment technologies included AS and AS+Fil in pilot and full-scale studies. The resulting effluent concentration for both studies was 10 ppb.

The proposed and promulgated BDAT standard was set using AS+Fil technology and an achievable effluent of 10 ppb. AS+Fil was selected as BDAT since it represents full-scale treatment performance with a high removal efficiency.

The resulting BDAT treatment standard for hexachloroethane is 0.055 ppm as shown in Table 6-10.

TABLE 4-97
WASTEWATER TREATMENT PERFORMANCE DATA
FOR HEXACHLOROETHANE

TECHNOLOGY	TECHNOLOGY SIZE	FACILITY	DETECTION LIMIT (ppb)	RANGE INFLUENT CONCENTRATION (ppb)	NO. OF DATA POINTS	AVERAGE EFFLUENT CONCENTRATION (ppb)	RECOVERY (%)	REMOVAL (%)	REFERENCE
AS	Pilot	241B		100-1000	11	10.000		97.1	WERL
* AS+Fil	Full	6B		100-1000	14	10.000		93.8	WERL *